

Biometric Vehicle Access And Ignition System Using Fingerprint Recognition

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Abstract: As variety of urban cars is growing very increasingly with the economy, and considering the individuals are becoming a lot about vehicle thievery which creates larger market for anti vehicle theft products. After that A lots of anti theft devices are being installed in vehicle but result is still unsatisfactory. Since every kind of devices has its own drawbacks therefore ,enhanced system has been proposed in this paper to ensure the vehicle safety and track of vehicle in the event of theft of vehicle. In this system we are using fingerprint based authentication to ignite the engine in addition to key mechanism. In this system we are using a Fingerprint Module (R307),Dc motor ,Motor Driver IC, CP-2102 USB to TTL Module, A MC ATmega 328P on a Self Made ARD. Uno board. A Guiding Wire for guiding the Structure, and Software IDE (Arduino IDE) for Programming the MC. The Heart of the entire System is MC ATmega 328P which is completely responsible for entire operation of Biometric authentication access to owner of vehicle.

Keywords: GSM=Global System for Mobile , MC = Microcontroller, ARD. Uno = Arduino Uno. USB = Universal Serial Bus, TTL = Transistor -Transistor Logic.

I. INTRODUCTION

In early days ,tracking the stolen vehicle is very difficult task, that's why vehicle tracking system becomes more popular Vehicle tracking system(VTS)which is combination of software and use of vehicle location which just collecting a common data of vehicles like picture of vehicle, color. Modern vehicle tracking system uses a GPS Technology to tracking vehicle. Car alarm becoming very popular also .but still stats shows that lots of people are not aware when

They hear alarm, hearing false alarm are making them to ignore it and also these type of alarm make too much noise ,so they are not good when you living in resident area. Sometimes driver drives to unknown place which also increases chances of vehicle theft. So we are using a biometric fingerprint scanner to access and ignite the vehicle, cause these physical mankind traits are very much unique and they are harder to fake them. One of the benefits of using fingerprint sensor is to minimize the crime of motorcycle theft that often happens in the community, due to turn on the motorcycle must go through the process of fingerprint recognition that is installed

II. LITERATURE SURVEY

2.1 Existing Security System

In today's days ,highly developed system uses the global positioning system(GPS)for tracking the vehicle position and current location of vehicle .GPS uses the global navigation satellite system .The positioning of vehicle which is send by FPS system which can be easily visualized by google earth .but the problem with GPS system is, if signal strength is not good or degraded then it is difficult for receiver to find position of vehicle and percentage of snowfall ,rain and fog also effect on the GPS. Radio Frequency Identification (RFID) is used in intelligent computerized anti-theft system, but RFID cards can be easily stolen. In addition to that ,key may getting malfunctioned when we contact with metallic object.

Biometric method is method of identifying human by their own unique characteristics .biometric technology which consist of iris, fingerprint, DNA, retina etc, but yet no biometric has been proven to be fully secure voice, signature hand shapes images easily forged; Due various issue of light accuracy of face recognition is very less. Fingerprint biometric is like a fully gifted or we can say that it is best in comparison to other for detecting a traits of person It is difficult to forged or steal and worldwide accepted. the two commonly used two techniques are pattern detection and minutiae matching the fingerprint

recognition mainly consist of pre-processing, feature extraction, pattern matching .the representation of these module is shown below.

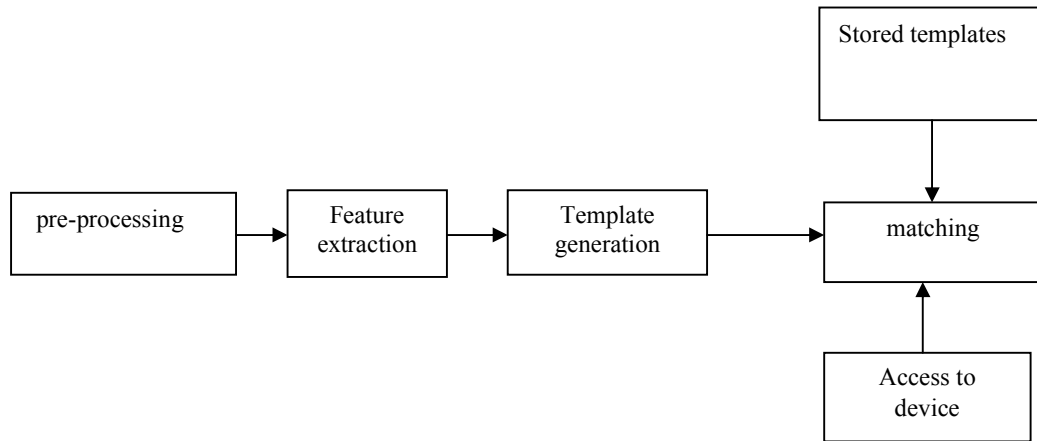


Figure: Working of Biometric System

2.2 Recent Advancement In Biometric Fingerprint Technology

A. Anti-Spoofing Mechanism

In early days of biometric technology ,spoofing and presentation are really big threds for this technology but over a time these type of spoof detection mechanism Techniques are getting improved .but still the outcome is really unsatisfactory improved anti-spoofing mechanism is still biggest achievement in domain of biometric technology

B. Increased Speed and Reduced Processing Time

In any technology processing speed of technology is major issue, for few couple of years biometric technology had al this issue. but over a time small hardware, efficient software and algorithm technology lower the processing time ,and increases the speed

C. Power Efficiency

Improved power efficiency of biometric devices or component is also major factor for reducing the processing time of component now days in every biometric component LED are used for improving power efficiency rather than traditional lamps as well as modern computer processors uses a low frequency which also keeps power efficiency better.

D. Ease of Integration

Now days it became very easy to integrating biometric for our own project and also manufacturer are offers SDK and API which makes them easy to integrate and make custom build project on biometric technology Which is a lot difficult few years ago.

E. Accuracy

Biometric technology uses physical traits of the mankind like a fingerprint ,face, ratina etc. so it is much harder to fake them and fingerprint is most reliable and secure mankind traits for vehicle safety. And it is worldwide accepted

III. PROBLEM STATEMENT

The main objective of this project is to increase the security feature of the car by integrating fingerprint and GSM module with the Arduino microcontroller. To achieve this objective:1 Control system using Arduino GSM module is proposed.2 Simulation of the proposed system is run. And also to design security system for vehicles and can be used in other application using fingerprint module and GSM.

IV. IMPLEMENTATION DETAILS

4.1 Hardware Requirements

- ARDUINO Uno Board (Self Made Arduino Board is used here)
- Cp2102 USB To TTL module
- Fingerprint Module
- GSM Module
- DC Motor
- Motor Driver IC Module
- Supporting Rods for Structure
- Connecting wires

4.2 Software Requirements

- Arduino IDE
- Eagle

Before moving onto the actual implementation let us get introduced with the hardware that we will be using in this project

A. Arduino UNO (Self Made)

Arduino Uno is a open source development board which consists of ATmega 328P Microcontroller IC the IC used here is nothing but the brain of the board. The Board consists of number of pins for various operations such as input and output pins known as IO pins for connecting various sensors and actuators. The Board has 14 digital IO pins out of which 6 pins are Pulse Width Modulation PWM pins, It also consists 6 analog IO pins for connecting analog devices such as microphone, potentiometer etc. The entire boards receives power from USB cable or by external battery which is of 9V, It also supports the voltages between 7V to 20V. Below Fig.6 Shows the Standard Arduino Uno Board which is available in market.

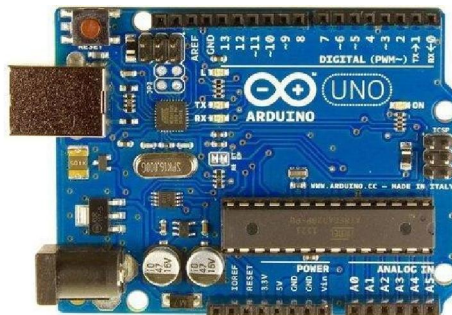


Figure 6: Standard Arduino Uno Board.

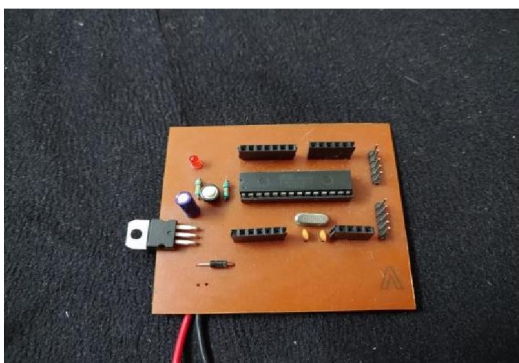


Figure 7: Self Made Arduino Uno Board.

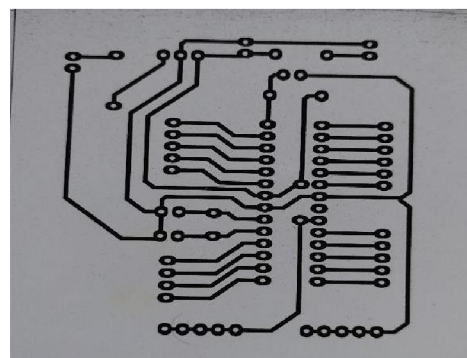


Figure 8: Layout of Self Made Arduino Uno Board

Above Fig.7 Shows the Arduino Uno Board which was made by us. Fig.8 Shows the Corresponding Layout of Tracks of Arduino Uno Board. The Entire Board is Designed Using a Popular PCB Designing Software “EAGLE”. The Safe Made Arduino Uno Board used here is much cheaper compared to the Standard Arduino Uno Board available inmarket.

B. CP2102 USB to TTL Module

As we all know that the Standard Arduino Uno Board is Capable of connecting to Computer for Programming directly using a USB A to USB B cable. This is all because the Standard Arduino Board Consists of ATmega 16U2 microcontroller IC/USB Controller which acts as a bridge for communication between Microcontroller and Computer.



Figure 9: CP2102 USB TO TTL Module.

As we know that The Board Used in this proposed plan is a self made one hence that board does not have ATmega 16U2 Microcontroller IC. Hence for Purpose of Programming The ATmega 328P IC on the board we are using CP2102 USB to TTL Module. The Fig.9 Shows the picture of USB To TTL Converter. It consists of CP2102 IC made by SiLabs which is a Bridge IC.

Some Features of this IC are:

- Reliable and Stable
- Standard USB A which can be easily connected to Laptop, PC or Devices having USBPort.
- USB 2.0 which provides the transmission speeds upto 12Mbps
- 6 pins:- 3.3V, Reset(RST), Transmitter pin (TX), Receiver pin(RX), Ground (GND) ,5V
- Support for Handshaking.

C. Fingerprint Module

The fingerprint module (R307) which biometric fingerprint module which comes with a USB-TTL interface. This module identify fingerprint minutiae pattern which is ultimately used to give access for application. This module can store the data of person and also can configured as 1:1 and 1:N for identifying authorized person. This module can directly interface with 5v microcontroller as well as it contains MAX232 level converter IC which is used when we need to interface with computer R307 fingerprint module consist of high –speed DSP processor, high performance and efficient fingerprint algorithm, hardware and software combination ,simple structure to enroll fingerprint, and other functions

Features:

- Supply voltage:4.2~6.0 V
- Peak current :80mA
- Fingerprint image input time<3sec
- Matching Mode:1:1 and 1:N



Figure 10: Fingerprint Module R307

D. GSM Module (SIM 900A)

Global system for mobile communication(GSM) is used in many mobile application as well as in IOT ,and embedded application.SIM 900A MODULE which uses dual band GSM/GPRS engine that works on Frequencies like 900MHZ to 1800MHZ .This module is really compact and reliable in sense of wireless communication which will benefitting for cost effective solution.



Figure 11: GSM Module (SIM900A)

GSM SIM 900A Module features are:

- Dual band 900/1800MHz
- GPS/GPRS Multislot 10/8
- Supply Vtg Range :3.2-4.8V
- Operating Temperature range:-30 to +40 deg
- Low Power Consumption
- Support UART, Keypad, Display, Real Time Clock Interface.
- Support MIC And Audio I Fig. 9 CP2102 USB TO TTL Module.

E. DC Motor

DC Motor is device which is used for converting electrical energy into mechanical energy. most common types of dc motor is rely on energy produced by motor itself by internal structure. Basic DC motor is contains parts like stator, magnetic coils ,rotor and commutator. speed of dc motor can be controlled over a wide range .it can be controlled by providing variable supply voltage or by changing strength of current which is produced in its fields coils in dc motor. The DC motor is one amongst the best motors available in market for carrying out Project work. DC motor can also moves in 360 deg.

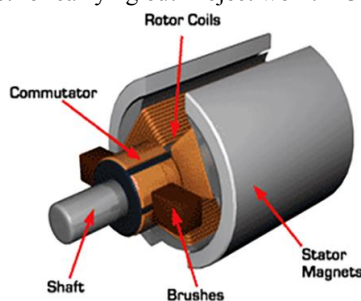


Figure 12: DC Motor.

DC Motor Features are:-

- No need of drive circuite when running at a constant speed
- High efficiency design.
- Able to operate at high speed
- High start-up Torque

F. Motor Driver IC (L298) Module

The L-298N is dual H –Bridge motor driver IC which allows speed and direction control of two DC motor at the same time. This motor driver can drive any kind of dc motor between range of 5v to 30v with peak current of 2mA. This L298N Module is high power motor driver for driving dc and stepper motor. It also consists of motor driver IC and 78M05 5 V regulator.

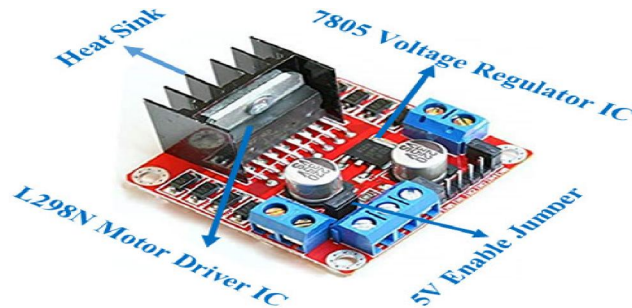


Figure 13: Motor Driver Module (L298)

Motor Driver Module Features and Specification

1. Driver Module: L298A
2. Double H Bridge L298N
3. Current sense for each motor
4. Maximum Power: 25W
5. Driver Voltage: 5-35V
6. Logical Current : 0-36mA

4.3 Actual Implementation

The Proposed solution here works Using the Sensors. The Sensor used here for Sensing Purpose is an fingerprint Sensor. The Sensor used for enroll and store fingerprint and accordingly Microcontroller takes the Action.

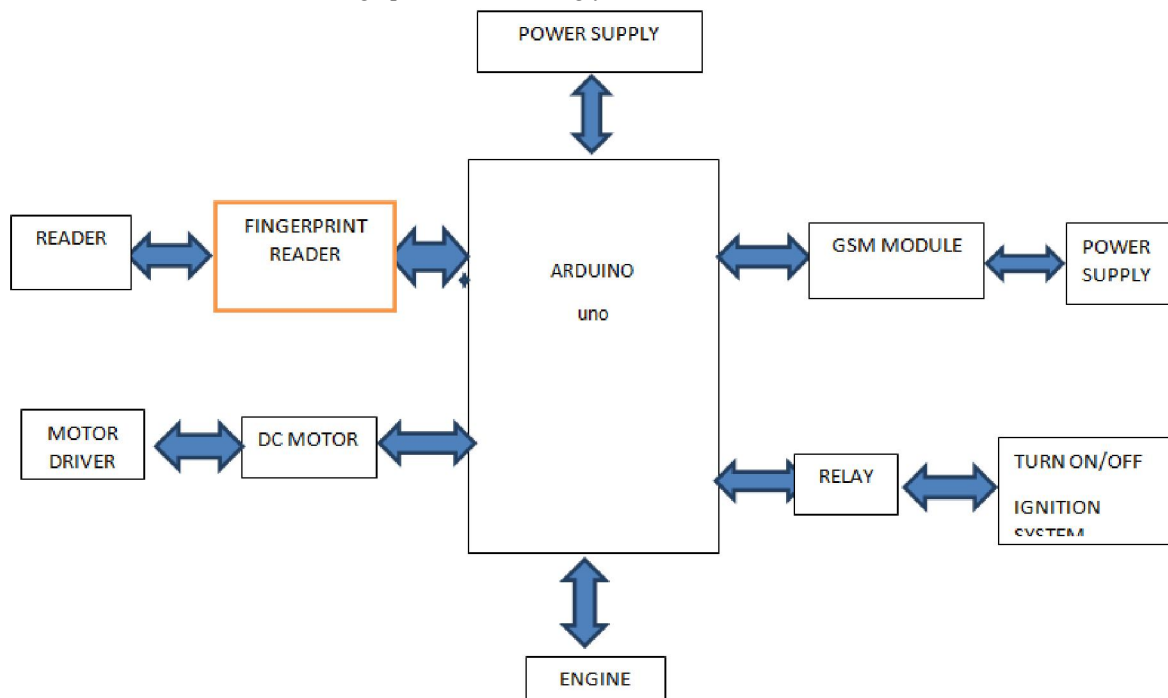


Figure 14: Block Diagram Of Biometric Vehicle Access And Ignition System

Figure 14 Shows the Block Diagram of Proposed System As shown in the block diagram. The proposed design uses GSM/GPRS based module to track and to provide access to a person in a remote location. This design involves the fingerprint module which provides high security and authentication based access to the owner, with addition to this we are using GSM module in case of any unauthorized person tries to access the vehicle then system will automatically sends message to owner of vehicle. GSM module is programmed with AT commands for communication .also GSM contains receiving antenna which receives signal from cell phone.

The Use of DC MOTOR and driver IC Module Here is an Additional module are used which is considered as engine of vehicle before connecting to vehicle..and arduino uno which has microcontroller AT328P which is a brain of the whole system. All modules controlled by person near the device can control it manually. Fingerprint identification enhances the security of a vehicle and makes it possible only for authorized person there are future improvements in terms of efficiency and accuracy which can be improved by improving hardware to capture the image or image enhancement techniques

V. ADVANTAGES

- Accuracy and high end protection: As one of the most sophisticated biometric modalities, fingerprint scanners provide almost 100% of accuracy during authentication. Faster access – Compared to typing a password, a fingerprint scanner can lock and unlock your workstation or device quickly. The biometric vehicle security system relies on biological Characteristics such as retinal and fingerprint scan ,voice recognition etc. this make it accurate and Difficult to gain access without permission of authorized user.
- User-Friendly: it is easy to install and user friendly. user requires minimum training to operate this system. It doesn't involve any expensive password administrator , and has low maintenance cost
- Convenient : they are highly efficient and convenient to gain control while pin and password can easily forgotten , hacked or stolen
- Easy Tracking: Being an automated system, it instantly track unauthorized access ,collect stored database, and forwards to its owner
- Quick: This system is quick in processing an access request, collecting database and recognizing authorization and improve security also.
- Attribute: physical attributes are much harder to fake than smart card or any other system

VI. CONCLUSION

In This proposed system fingerprint based authentication and GSM model provides better security for vehicle rather than traditional key mechanism. which gives access to the only to authorized person .If someone else tries to access it system will automatically send SMS to owner of vehicle and also co-ordinates of vehicle. The thief would have to do great deal with good homework to steal vehicle, and it is very unlikely that they have biometric fingerprint technology needed to fake your fingerprint to access your vehicle.

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